

Appendix C

Scoping Process to Determine Potential Contaminants of Concern

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July 11, 1992

Ms. Carol Mascarenas
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SUBJECT: Draft Contaminants of Concern (COC) Tables for CPP-26, -32E, and 79

Dear Carol:

Enclosed are the COC tables for the three sites within OU 3-7. The calculations have now been reviewed with only minor modifications since the draft tables (dated July 8). Also enclosed is a summary table listing the COC as compared to the list identified in the April 30, 1992 document. Attached to this table is a copy of the April 30 data with boxes highlighted that have changed in this current submittal. Finally, enclosed is a memo-for-file describing the calculations that were performed to develop screening concentrations in situations where no analytical data existed.

Four additional solvents were added per our telephone conversation of July 10. In all cases, these new organics are identified as COC since no data was provided as to their possible concentration. As soon as an estimated concentration is available, it is likely that some, if not all, can be dropped out since the risk based concentrations are usually quite high.

Please let me know if you have any questions.

Sincerely,

Keith Davis

Keith D. Davis, P.E.
Project Manager

KDD/048/0792
Enclosure

cc: O. K. Earle, WINCO

Contaminants of Concern
April 30, 1992 Draft Document Vs. Current (July) Documentation

Contaminant of Concern	CPP-26		CPP-32E		CPP-79	
	April	Current	April	Current	April	Current
Strontium-90		X		X		X
Technetium-99		X		X		X
Ruthenium-106	X					
Iodine-129		X		X		X
Cesium-137		X		X		X
Uranium-234		X		X		X
Uranium-235		X		X		X
Uranium-238		X				
Neptunium-237		X		X		X
Plutonium-238		X		X		X
Plutonium-239		X		X		X
Plutonium-240		X		X		X
Plutonium-242	X	X				
Americium-241		X		X		X
Radionuclides			X		X	
Boron	X		X		X	
Cadmium	X	X	X	X	X	X
Chromium	X	X	X		X	
Fluoride		X			X	
Manganese		X				
Mercury	X	X	X	X	X	X
Molybdenum	X		X		X	
Nickel	X	X	X		X	
Nitrate		X				X

DRAFT

OPERABLE UNIT 3-07

TANK FARM I

CONTAMINANTS OF CONCERN

April 30, 1992

OPERABLE UNIT 3-07, TANK FARM
Contaminants of Concern

The following is a list of contaminants of concern (COC) for each site being sampled in Operable Unit 3-07. The known contaminants (radionuclides) for CPP-26 were screened against all pathways and using current concentrations (i.e. allowing for decay). The potential metals at CPP-26 and potential contaminants at sites CPP-32E and -79 do not have site specific data available to screen against. Back calculations were performed for each contaminant per pathway. These results were compared to determine contaminants of concern per pathway and the limiting soil concentrations. Tables 1 and 2 present the results of this evaluation. As shown on Tables 1 and 2, all contaminants in the groundwater pathway, with the exception of boron, molybdenum and chromium, fall out of the risk criteria.

SITE	CONTAMINANT OF CONCERN
26	Plutonium 242 Ruthenium Cadmium Chromium Nickel Molybdenum Boron Mercury
32E; 79	Radionuclides Cadmium Chromium Nickel Molybdenum Boron Mercury Fluoride*

NOTE: (*) Only applicable to CPP-79

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CONTAMINANTS OF CONCERN
RESIDENTIAL SCENARIO
CPP 26

X

CONTAMINANT	INGESTION (1)	INHALED (2)	GROUNDWATER ^a (3)	EXTERNAL EXPOSURE (4)	CURRENT ESTIMATED CONCENTRATION	COC
KNOWN RADIONUCLIDES (pCi/g)						
Pu-242	1.2E+01	0.3E+05	> 1000 yrs (kd > 2)	2.1E+00	3E-5	Y
Pu-239	No health based concentrations				0	N
Ru-106	2.5E+31	5.9E+27	> 1000 yrs (kd > 2)	NA	1.97E-8	N
Cs-137	2.6E+40	4.3E+36	> 1000 yrs vis + > 1000 yrs	3.5E+37	3.48E-10	N
Cs-134	1.32E+02	1.4E+00	> 1000 yrs	1.1E-04 (8e-13)	2.73E-1	N
Cs-134	3.5E+15	4.8E+13	> 1000 yrs + > 5H ₂ O	4.2E+11	2.01E-7	N
Metals: Assumed based on ILLW constituents (mg/kg)						
Aluminum		Reject per Track 2 Guidance			Unknown	N
Cadmium	2.7E+02	5.9E+02	> 1000 yrs	NA	Unknown	Y
Niobium		No health based concentrations			Unknown	N
Sodium		Reject per Track 2 Guidance			Unknown	N
Iron		Reject per Track 2 Guidance			Unknown	N
Chromium III	2.7E+05	8E-03	< 1000 yrs	NA	Unknown	Y
Nickel	5.4E+03	ND	> 1000 yrs	NA	Unknown	Y
Gadolinium		No health based concentrations			Unknown	N
Molybdenum	1.08E+00	ND	< 1000 yrs	NA	Unknown	Y
Ruthenium		No health based concentration			Unknown	N
Rhodium		No health based concentration			Unknown	N
Palladium		No health based concentration			Unknown	N
Boron	ND	ND	< 1000 yrs	NA	Unknown	Y
Mercury	8.1E+01	1.9E+00	> 1000 yrs	NA	Unknown	Y

NOTES:

(a) Using a 20m effective thickness to groundwater (16m average interbed thickness + 4m alluvium below contaminated zone).

NA: Not Applicable

ND: Not determined (no health based concentration)

CONTAMINANTS OF CONCERN
RESIDENTIAL SCENARIO
CPP-32 E

CONTAMINANT	INGESTION (1)	INH /DUST (2)	GROUNDWATER ¹ (3)	EXTERNAL EXPOSURE (4)	ESTIMATED CURRENT CONCENTRATION (5)	COC
RADIONUCLIDES (pCi/g) DERIVED FROM TYPICAL HLW CONSTITUENTS						
Europium-155	ND	ND	> 1000 YRS (kd > 2)	ND	Unknown	N
Cobalt-60	1.3E+07	3.7E+10	> 1000 yrs.	4.0E+02	Unknown	Note (1)
Zirconium-95	ND	ND	> 1000yrs + 5HL's	ND	Unknown	N
Ruthenium-106	3.4+31	5.0E+27	> 5HL's	NA	Unknown	Note (1)
Antimony-125	ND	ND	> 1000yrs + 5HL's	ND	Unknown	N
Cesium-134	3.5+01	3.6E+20	> 1000yrs + 5HL's	4.3E+11	Unknown	Note (1)
Cesium-137	1.3E+02	6.0E+06	> 1000yrs + 5HL's	NA	Unknown	Note (1)
Cesium-144	2.6E+40	1.4E+43	> 1000 yrs	3.5E+32	Unknown	Note (1)
Europium-154	4.0E+05	4.6E+08	> 1000yrs + 5HL's	4.7E+00	Unknown	Note (1)
Strontium-90	1.2E+02	2.2E+06	cannot measure soil activity; will be tested for in groundwater	NA	Unknown	Note (1)
Tritium	cannot measure soil activity; will be tested for in groundwater				Unknown	Y
Uranium-234	2.6E+00	4.1E+02	> 1000 yrs	1.8E+00	Unknown	Note (1)
Uranium-235	2.9E+00	4.4E+02	> 1000 yrs	1.0E-02	Unknown	Note (1)
Uranium-238	2.8E+00	4.8E+02	> 1000 yrs	2.2E+00	Unknown	Note (1)
Plutonium-238	2.9E+00	6.0E+02	> 1000 yrs	3.7E+00	Unknown	Note (1)
Plutonium-239	1.2E+01	2.2E+02	> 1000 yrs	3.9E+00	Unknown	Note (1)
Plutonium-240	1.2E+01	2.8E+02	> 1000 yrs	1.7E+00	Unknown	Note (1)
Mn-54	6.0E+37	3.6E+41	> 1000 yrs (kd > 2)	3.4E+32	Unknown	Note (1)

0.3 no. 1.3e

CONTAMINANT	INGESTION (1)	INH/DIIST (2)	GROUNDWATER ^a (3)	EXTERNAL EXPOSURE (4)	CURRENT ESTIMATED CONCENTRATION	COC
Metals: Assumed based on HLLW constituents. (mg/kg)						
Aluminum		Reject per Track 2 guidance			Unknown	N
Cadmium	2.7E+02	ND	> 1000 yrs	NA	Unknown	Y
Niobium		No health based concentrations			Unknown	N
Sodium		Reject per Track 2 Guidance			Unknown	N
Iron		Reject per Track 2 Guidance			Unknown	N
Chromium III	2.7E+05	4.2E+00	< 1000 yrs	NA	Unknown	Y
Nickel	5.4E+03		> 1000 yrs	NA	Unknown	Y
Gadolinium		No health based concentrations			Unknown	N
Molybdenum	1.08E+00		< 1000 yrs	NA	Unknown	Y
Ruthenium		No health based concentration			Unknown	N
Rhodium		No health based concentration			Unknown	N
Palladium		No health based concentration			Unknown	N
Boron	ND	ND	< 1000 yrs	NA	Unknown	Y
Mercury	8.1E+01	6.4E+02	> 1000 yrs	NA	Unknown	Y

NOTES: These constituents are COC based upon the soil pathway only. No site specific data or process knowledge is available to eliminate any COC.

(1) Using a 20m effective thickness to groundwater (16m average interbed thickness + 4m alluvium below contaminated zone).

NA: Not Applicable

ND: Not determined (no health based concentration)

CONTAMINANTS OF CONCERN
RESIDENTIAL SCENARIO
CPP-79

CONTAMINANT	INGESTION (1)	INH/DUST (2)	GROUNDWATER ¹ (3)	EXTERNAL EXPOSURE (4)	ESTIMATED CURRENT CONCENTRATION (5)	COC
RADIONUCLIDES (pCi/g) DERIVED FROM TYPICAL HLW CONSTITUENTS						
Europium-155	ND	ND	> 1000 YRS (kd > 2)	ND	Unknown	N
Cobalt-60	1.3E+07	6.5E+09	> 1000 yrs.	4.0E+02	Unknown	Note (1)
Zirconium-95	ND	ND	> 1000 yrs + 5HL's	ND	Unknown	N
Ruthenium-106	3.5+01	2.9E+33	> 5 HL's	NA	Unknown	Note (1)
Antimony-125	ND	ND	> 1000 yrs + 5HL's	NA	Unknown	N
Cesium-134	3.5E+15	2.8E+19	> 1000 yrs + 5HL's	4.3E+11	Unknown	Note (1)
Cesium-137	1.3E+02	1.0E-06	> 1000 yrs + 5HL's	NA	Unknown	Note (1)
Cerium-144	2.6E+40	1.2E+42	> 1000 yrs	3.9E+37	Unknown	Note (1)
Europium-154	4.0E+05	4.5E+07	Decays 1 yr before 100 yrs.	4.7E+00	Unknown	Note (1)
Strontium-90	1.2E+02	3.9E+05	> 1000 yrs	NA	Unknown	Note (1)
Tritium	cannot measure soil activity, will be tested for in groundwater				Unknown	Y
Uranium-234	2.6E+00	7.3E+01	> 1000 yrs	1.8E+00	Unknown	Note (1)
Uranium-235	2.9E+01	7.8E+01	> 1000 yrs	1.0E-02	Unknown	Note (1)
Uranium-238	2.8E+00	8.5E+01	> 1000 yrs	2.2E+00	Unknown	Note (1)
Plutonium-238	2.9E+00	1.1E+02	> 1000 yrs	3.7E+00	Unknown	Note (1)
Plutonium-239	1.2E+01	4.0E+01	> 1000 yrs	3.9E+00	Unknown	Note (1)
Plutonium-240	1.2E+01	5.0E+01	> 1000 yrs	1.7E+00	Unknown	Note (1)
Mn-54.7	5.6E+37	6.3E+40	> 1000 yrs (kd > 2)	3.4E+32	Unknown	Note (1)

CONTAMINANT	INGESTION (1)	INH/DUST (2)	GROUNDWATER nd (3)	EXTERNAL EXPOSURE (4)	CURRENT ESTIMATED CONCENTRATION (5)	COC
Metals: Assumed based on HLLW constituents: (mg/kg)						
Aluminum		Reject per Track 2 guidance			Unknown	N
Cadmium	2.7E+02	ND	> 1000 yrs	NA	Unknown	Y
Niobium		No health based concentrations			Unknown	N
Sodium		Reject: per Track 2 Guidance			Unknown	N
Iron		Reject: per Track 2 Guidance			Unknown	N
Chromium III	2.7E+05	4.2E+00	< 1000 yrs	NA	Unknown	Y
Nickel	5.4E+03		> 1000 yrs	NA	Unknown	Y
Gadolinium		No health based concentrations			Unknown	N
Molybdenum	1.08E+00		< 1000 yrs	NA	Unknown	Y
Ruthenium		No health based concentration			Unknown	N
Rhodium		No health based concentration			Unknown	N
Palladium		No health based concentration			Unknown	N
Boron	ND	ND	< 1000 yrs	NA	Unknown	Y
Fluoride	2E+04	ND	< 1000 yrs	ND	Unknown	Y
Mercury	8.1E+01	6.4E+02	> 1000 yrs	NA	Unknown	Y

NOTES:

(1) These constituents are COC based upon the soil pathway only. No site specific data or process knowledge is available to eliminate any COC.

(a) Using a 20m effective thickness to groundwater (16m average interbed thickness + 4m alluvium below contaminated zone).

NA: Not Applicable

ND: Not determined (no health based concentration)

CONTAMINANTS OF CONCERN
RESIDENTIAL SCENARIO
CPP-26

CONTAMINANT	INGESTION	INH/DUST	GROUNDWATER ^{na}	EXTERNAL EXPOSURE	CURRENT ESTIMATED CONCENTRATION	CONTAMINANT OF CONCERN (Y or N)
Radionuclides (pCi/g): Assumed based on III L W constituents						
Tritium	cannot measured soil activity		will be tested	NA	Unknown	Y
Cobalt-60	1.3E+07	1.2E+06	2.450yrs at Kd=10	4.0E+02	Unknown	N (1)
Strontium-90	1.2E+02	7.0E+01	774yrs at Kd=3 (> 7 half lives)	NA	Unknown	Y
Zirconium-95	No health based concentrations		144,050yrs at Kd=600		Unknown	N (2)
Niobium-95	No health based concentrations		54yrs at Kd=0		Unknown	N (2)
Technetium-99	2.9E+02	4.3E+01	4.0E+00	2.9E+03 (3)	Unknown	Y
Ruthenium-103	No health based concentrations				0 (decayed)	N (2)
Ruthenium-106	1.3E+31	2.6E+29	54yrs at Kd=0	NA	2.0E-05	N (2)(4)
Antimony-125	No health based concentrations		12,050yrs at Kd=50		Unknown	N (2)
Iodine-129	2.0E+00	2.9E+00	2.6E-02	6.7E-02	Unknown	Y
Cesium-134	3.5E+15	4.8E+13	120,050yrs at Kd=500	4.3E+11	2.6E-04	N (2)
Cesium-137	1.3E+02	1.9E+02	120,050yrs at Kd=500	3.0E-02 (Ba-137)	2.7E+02	Y
Cerium-144	2.6E+40	4.3E+36	120,050yrs at Kd=500	3.5E+37	6.4E-07	N (2)(4)
Europium-154	4.0E+05	8.1E+03	1.5E+02 54yrs at Kd=0	4.7E+00	Unknown	N (1)
Europium-155	No health based concentrations		Total decay in 33 yrs		Unknown	N (1)
Uranium-234	2.6E+00	1.3E-02	4.2E-02 1,490yrs at Kd=6	1.8E+00	Unknown	Y
Uranium-235	2.9E+00 (3)	1.4E-02	4.5E-02 1,490yrs at Kd=6	1.0E-02	Unknown	Y
Uranium-238	2.9E+00 (3)	1.5E-02	4.5E-02 1,490yrs at Kd=6	2.2E+00 (3)	Unknown	Y
Neptunium-237	1.4E+00	1.0E-02	1.9E-02 (Assumed Kd=0)	5.6E-02	Unknown	Y

CONTAMINANTS OF CONCERN
RESIDENTIAL SCENARIO
CPP-26

CONTAMINANT	INGESTION	INH/DUST	GROUNDWATER ^m	EXTERNAL EXPOSURE	CURRENT ESTIMATED CONCENTRATION	CONTAMINANT OF CONCERN (Y or N)
Plutonium-238	2.9E+00	1.9E-02	5.330yrs at Kd=22	3.7E+00	Unknown	Y
Plutonium-239	1.2E+01	7.0E-03	5.330yrs at Kd=22	3.9E+00	Unknown	Y
Plutonium-240	1.2E+01	8.8E-03	5.330yrs at Kd=22	1.7E+00	Unknown	Y
Plutonium-242	1.2E+01 (3)	8.7E-03	5.330yrs at Kd=22	2.1E+00 (3)	3.0E-02	Y
Americium-241	1.4E+00	1.0E-02	81.650yrs at Kd=340	6.3E-02	Unknown	Y
Non-Radioactive Components (mg/kg); Assumed based on HLLW constituents						
Aluminum	Reject - Track 2 Guidance				Unknown	N
Boron	2.5E+04 (3)	No Data	Kd Not Available	NA	Unknown	N
Cadmium	2.7E+02	2.4E-01	1.2E+00 1.490yrs at Kd=6	NA	Unknown	Y
Calcium	Reject - Track 2 Guidance				Unknown	N
Chloride	No health based concentrations				Unknown	Y
Chromium (VI)	1.4E+03 (3)	3.6E-01	1.4E+00 342yrs at Kd=1.2	NA	Unknown	Y
Fluoride	2.0E+04 (3)	No Data	1.1E+01 54yrs at Kd=0	NA	Unknown	N
Gadolinium	No health based concentrations				Unknown	N
Iron	Reject - Track 2 Guidance				Unknown	N
Lead	5.0E+02 (b)(3)	No Data	24.050yrs at Kd=100	NA	Unknown	Y
Manganese	2.7E+04 (3)	7.3E+01	12.050yrs at Kd=50	NA	Unknown	Y
Mercury	8.2E+01	5.4E+01	24.050yrs at Kd=100	NA	Unknown	N
Molybdenum	1.1E+03 (3)	No Data	1.7E+01 (3) (Assumed Kd=0)	NA	Unknown	Y
Nickel	5.4E+03 (3)	1.8E+00	24.050yrs at Kd=100	NA	Unknown	N
Niobium	No health based concentrations				Unknown	N

CONTAMINANTS OF CONCERN
RESIDENTIAL SCENARIO
CPP-26

CONTAMINANT	INGESTION	INH/DUST	GROUNDWATER ^m	EXTERNAL EXPOSURE	CURRENT ESTIMATED CONCENTRATION	CONTAMINANT OF CONCERN (Y or N)
Nitrate	2.7E+04 (3)	No Data	2.7E+01	NA	Unknown	Y
Palladium	No health based concentrations				Unknown	N
Phosphorus	No health based concentrations				Unknown	N
Potassium	Reject - Track 2 Guidance				Unknown	N
Rhodium	No health based concentrations				Unknown	N
Ruthenium	No health based concentrations				Unknown	N
Sodium	Reject - Track 2 Guidance				Unknown	N
Sulfate	No health based concentrations		6.8E+02 (3)		Unknown	N
Zirconium	No health based concentrations				Unknown	N
Hexane	1.4E+04	3.6E+03	2.1E+02	NA	Unknown	N (5)
Tetrachloroethylene	1.3E+01	1.0E+01	1.4E-02	NA	Unknown	Y
Triethyl Phosphate	3.3E+05 (6)	4.5E+05 (6)	5.1E+03	NA	Unknown	N (5)
1,1,1-Trichloroethane	2.5E+04	5.7E+04	5.4E-01	NA	Unknown	Y
1,1,2-Trichloroethane	1.1E+01	2.7E+01	1.7E+01	NA	Unknown	Y
Trichloroethylene	5.8E+01	9.1E+01	5.4E-02	NA	Unknown	Y

NOTES:

- (a) Using a 16m effective thickness to groundwater (inherited thickness only) as input to GW Screen.
- (b) For ingestion of lead, this was the concentration that causes increased blood lead levels in children.
- NA: Not Applicable

Shade: Shaded areas represent the potential pathways of concern for the COC.

RATIONALE FOR DELETION AS COC

- (1) More than 7 half-lives will lapse during the 100 year institutional control period.

- (2) More than 7 half-lives have lapsed since the original incident in 1964.

- (3) Based on the highest value in HLLW for this contaminant, saturated soil would exhibit an activity/concentration of the same order of magnitude, or lower, as compared to the risk based concentration. Therefore, it is not a COC for this pathway. Saturated soil concentrations were calculated based on a soil porosity of 25% and a dry soil weight of 1.5 mg/cc.

- (4) Risk based concentrations are greater than or equal to the calculated specific activity of the pure radionuclide.
- (5) Although analytical data is currently unavailable, the risk based concentrations for these contaminants are significantly higher than process knowledge of the HLLW would allow. These solvents must survive a steam stripper to get to the HLLW tanks.

- (6) These numbers are of the same order of magnitude, or higher, as would be obtained from soil saturated with pure product.

CONTAMINANTS OF CONCERN
RESIDENTIAL SCENARIO
CPP-32 E

CONTAMINANT	INGESTION	INH/DUST	GROUNDWATER [~]	EXTERNAL EXPOSURE	CURRENT ESTIMATED CONCENTRATION	CONTAMINANT OF CONCERN (Y or N)
Radionuclides (pCi/g): Assumed based on HLLW constituents						
Tritium	cannot measured soil activity		will be tested	NA	Unknown	Y
Cobalt-60	1.3E+07	3.7E+10	2,450yrs at Kd=10	4.0E+02	Unknown	N (1)
Strontium-90	1.2E+02	2.2E+06	774yrs at Kd=3 (> 7 half-lives)	NA	Unknown	Y
Zirconium-95	No health based concentrations		144,050yrs at Kd=600		Unknown	N (2)
Nickel-95	No health based concentrations		54yrs at Kd=0		Unknown	N (2)
Technetium-99	2.9E+02	1.4E+06 (3)	2.5E+03 (3)	2.9E+03 (3)	Unknown	Y
Ruthenium-106	1.3E+31	8.4E+33	54yrs at Kd=0	NA	Unknown	N (2)(4)
Antimony-125	No health based concentrations		12,050yrs at Kd=50		Unknown	N (1)
Iodine-129	2.0E+00	9.4E+04 (3)	3.1E+01	6.7E-02	Unknown	Y
Cesium-134	3.5E+15	1.6E+20	120,050yrs at Kd=500	4.3E+11	Unknown	N (2)
Cesium-137	1.3E+02	6.0E+06	120,050yrs at Kd=500	3.0E-02 (Ba-137)	Unknown	Y
Cerium-144	2.6E+40	1.4E+43	120,050yrs at Kd=500	3.5E+37	Unknown	N (2)(4)
Europium-154	4.0E+05	2.6E+08	1.1E+05 54yrs at Kd=0	4.7E+00	Unknown	N (1)
Europium-155	No health based concentrations		Total decay in 33yrs	NA	Unknown	N (1)
Uranium-234	2.6E+00	4.1E+02 (3)	2.9E+01 1,490yrs at Kd=6	1.8E+00	Unknown	Y
Uranium-235	2.9E+00 (3)	4.4E+02 (3)	3.1E+01 (3) 1,490yrs at Kd=6	1.0E-02	Unknown	Y
Uranium-238	2.9E+00 (3)	4.8E+02 (3)	3.1E+01 (3) 1,490yrs at Kd=6	2.2E+00 (3)	Unknown	N
Neptunium-237	1.4E+00	3.2E+02 (3)	1.2E+01 (Assumed Kd=0)	5.6E-02	Unknown	Y
Plutonium-238	2.9E+00	6.0E+02	5,330yrs at Kd=22	3.7E+00	Unknown	Y

CONTAMINANTS OF CONCERN
RESIDENTIAL SCENARIO
CPP-32 E

CONTAMINANT	INGESTION	INII/DUST	GROUNDWATER ^W	EXTERNAL EXPOSURE	CURRENT ESTIMATED CONCENTRATION	CONTAMINANT OF CONCERN (Y or N)
Plutonium-239	1.2E+01	2.2E+02	5.30yrs at Kd=22	3.9E+00	Unknown	Y
Plutonium-240	1.2E+01	2.8E+02	5.30yrs at Kd=22	1.7E+00	Unknown	Y
Americium-241	1.4E+00	3.2E+02	81.650yrs at Kd=340	6.3E-02	Unknown	Y
Non Radioactive Components (mg/kg); Assumed based on H11.1.W constituents						
Aluminum	Reject - Track 2 Guidance				Unknown	N
Boron	2.5E+04 (3)	No Data	Kd Not Available	NA	Unknown	N
Cadmium	2.7E+02	8.0E+03 (3)	1.1E+03 (3) 1,490yrs at Kd=6	NA	Unknown	Y
Calcium	Reject - Track 2 Guidance				Unknown	N
Chloride	No health based concentrations				Unknown	N
Chromium (VI)	1.4E+03 (3)	1.2E+04 (3)	1.3E+03 (3) 342yrs at Kd=1.2	NA	Unknown	N
Fluoride	2.0E+04 (3)	No Data	1.7E+04 (3) 54yrs at Kd=0	NA	Unknown	N
Gadolinium	No health based concentrations				Unknown	N
Iron	Reject - Track 2 Guidance				Unknown	N
Lead	5.0E+02 (3)	No Data	24,050yrs at Kd=100	NA	Unknown	N
Manganese	2.7E+04 (3)	2.4E+06 (3)	12,050yrs at Kd=50	NA	Unknown	N
Mercury	8.2E+01	1.8E+06 (3)	24,050yrs at Kd=100	NA	Unknown	Y
Molybdenum	1.1E+03 (3)	No Data	1.1E+04 (3) (Assumed Kd=0)	NA	Unknown	N
Nickel	5.4E+03 (3)	5.8E+04 (3)	24,050yrs at Kd=100	NA	Unknown	N
Niobium	No health based concentrations				Unknown	N
Nitrate (Nitrite)	2.7E+04 (3)	No Data	4.1E+04 (3)	NA	Unknown	N
Palladium	No health based concentrations				Unknown	N

**CONTAMINANTS OF CONCERN
RESIDENTIAL SCENARIO
CPP-32 E**

CONTAMINANT	INGESTION	INH/DUST	GROUNDWATER ^(a)	EXTERNAL EXPOSURE	CURRENT ESTIMATED CONCENTRATION	CONTAMINANT OF CONCERN (Y or N)
Phosphorus	No health based concentrations				Unknown	N
Potassium	Reject - Track 2 Guidance				Unknown	N
Rhodium	No health based concentrations				Unknown	N
Ruthenium	No health based concentrations				Unknown	N
Sodium	Reject - Track 2 Guidance				Unknown	N
Sulfate	No health based concentrations		1.0E+06 (3)	NA	Unknown	N
Zirconium	No health based concentrations				Unknown	N
Hexone	1.4E+04	2.0E+08 (6)	1.3E+06 (6)	NA	Unknown	N (5)
Tetrachloroethylene	1.3E+01	3.1E+03	2.1E+01	NA	Unknown	Y
Tributyl Phosphate	3.3E+05 (6)	2.5E+10 (6)	3.2E+06 (6)	NA	Unknown	N (5)
1,1,1-Trichloroethane	2.5E+04	1.8E+09 (6)	4.3E+02	NA	Unknown	Y
1,1,2-Trichloroethane	1.1E+01	8.6E+05 (6)	1.1E+04	NA	Unknown	Y
Trichloroethylene	5.3E+01	2.9E+06 (6)	5.8E+01	NA	Unknown	Y

NOTES:

- (a) Using a 16m effective thickness to groundwater (inserted thickness only) as input to GW Screen.
 (b) For ingestion of lead, this was the concentration that causes increased blood lead levels in children.

NA: Not Applicable

Shade: Shaded areas represent the potential pathways of concern for the COC.

RATIONALE FOR DELETION AS COC

- (1) More than 7 half-lives will lapse during the 100 year institutional control period.

- (2) More than 7 half-lives have lapsed since the original incident in 1976.

- (3) Based on the highest value in HLLW for this contaminant, saturated soil would exhibit an activity/concentration of the same order of magnitude, or lower, as compared to the risk based concentration. Therefore, it is not a COC for this pathway. Saturated soil concentrations were calculated based on a soil porosity of 25% and a dry soil weight of 1.5 mg/cc.

- (4) Risk based concentrations are greater than or equal to the calculated specific activity of the pure radionuclide.

- (5) Although analytical data is currently unavailable, the risk based concentrations for these contaminants are significantly higher than process knowledge of the HLLW would allow. These solvents must survive a steam stripper to get to the HLLW tanks.

- (6) These numbers are of the same order of magnitude, or higher, as would be obtained from soil saturated with pure product.

CONTAMINANTS OF CONCERN
RESIDENTIAL SCENARIO
CPP-79

CONTAMINANT	INGESTION	INH/DUST	GROUNDWATER ^W	EXTERNAL EXPOSURE	CURRENT ESTIMATED CONCENTRATION	CONTAMINANT OF CONCERN (Y or N)
Radionuclides (pCi/g): Assumed based on HLLW constituents						
Tritium	cannot measured soil activity		will be tested	NA	Unknown	Y
Cobalt-60	1.3E+07	6.5E+09	2,450yrs at Kd=10	4.0E+02	Unknown	N (1)
Sr-90	1.2E+02	3.9E+05	774yrs at Kd=3 (> 7 half-lives)	NA	Unknown	Y
Zr-95	No health based concentrations		144,050yrs at Kd=600		Unknown	N (2)
Ni-95	No health based concentrations		54yrs at Kd=0		Unknown	N (2)
Tc-99	2.9E+02	2.4E+05 (3)	1.6E+02	2.9E+03 (3)	Unknown	Y
Ru-106	1.3E+31	2.9E+33	54yrs at Kd=0	NA	Unknown	N (2)
As-125	No health based concentrations		12,050yrs at Kd=50		Unknown	N (1)
I-129	2.0E+00	1.7E+04 (3)	1.0E+00	6.7E-02	Unknown	Y
Cs-134	3.5E+15	2.8E+19	120,050yrs at Kd=500	4.3E+11	Unknown	N (2)(4)
Cs-137	1.3E+02	1.0E+06	120,050yrs at Kd=500	3.0E-02 (Ba-137)	Unknown	Y
Ce-144	2.6E+40	2.4E+42	120,050yrs at Kd=500	3.5E+37	Unknown	N (2)(4)
Eu-154	4.0E+05	4.5E+07	7.0E+03 54yrs at Kd=0	4.7E+00	Unknown	N (1)
Eu-155	No health based concentrations		Total decay in 33yrs		Unknown	N (1)
U-234	2.6E+00	7.3E+01	2.0E+00 1,490yrs at Kd=6	1.8E+00	Unknown	Y
U-235	2.9E+00 (3)	7.8E+01 (3)	2.1E+00 (3) 1,490yrs at Kd=6	1.0E-02	Unknown	Y
U-238	2.9E+00 (3)	8.5E+01 (3)	2.1E+00 (3) 1,490yrs at Kd=6	2.2E+00 (3)	Unknown	N
Np-237	1.4E+00	5.7E+01	7.4E-01 (Assumed Kd=0)	5.6E-02	Unknown	Y
Pl-238	2.9E+00	1.1E+02	5,330yrs at Kd=22	3.7E+00	Unknown	Y

CONTAMINANTS OF CONCERN
RESIDENTIAL SCENARIO
CPP-79

CONTAMINANT	INGESTION	INH/DUST	GROUNDWATER ^W	EXTERNAL EXPOSURE	CURRENT ESTIMATED CONCENTRATION	CONTAMINANT OF CONCERN (Y or N)
Plutonium-239	1.2E+01	4.0E+01	5,330yrs at Kd=22	5.9E+00	Unknown	Y
Plutonium-240	1.2E+01	5.0E+01	5,330yrs at Kd=22	1.7E+00	Unknown	Y
Americium-241	1.4E+00	5.7E+01	81,650yrs at Kd=340	6.3E-02	Unknown	Y
Non-Radioactive Components (mg/kg); Assumed based on HLLW constituents						
Aluminum	Reject - Track 2 Guidance				Unknown	N
Boron	2.5E+04 (3)	No Data	Kd Not Available	NA	Unknown	N
Cadmium	2.7E+02	1.4E+03 (3)	9.7E+01 1,490yrs at Kd=6	NA	Unknown	Y
Calcium	Reject - Track 2 Guidance				Unknown	N
Chloride	No health based concentrations				Unknown	N
Chromium (VI)	1.4E+03 (3)	2.1E+03 (3)	1.1E+02 (3) 342yrs at Kd=1.2	NA	Unknown	N
Fluoride	2.0E+04 (3)	No Data	1.3E+03 (3) 54yrs at Kd=0	NA	Unknown	N
Gadolinium	No health based concentrations				Unknown	N
Iron	Reject - Track 2 Guidance				Unknown	N
Lead	5.0E+02 (b)(3)	No Data	24,050yrs at Kd=100	NA	Unknown	N
Manganese	2.7E+04 (3)	4.3E+05 (3)	12,050yrs at Kd=50	NA	Unknown	N
Mercury	8.2E+01	3.2E+05 (3)	24,050yrs at Kd=100	NA	Unknown	Y
Molybdenum	1.1E+03 (3)	No Data	6.7E+02 (3) (Assumed Kd=0)	NA	Unknown	N
Nickel	5.4E+03 (3)	1.0E+04 (3)	24,050yrs at Kd=100	NA	Unknown	N
Niobium	No health based concentrations				Unknown	N
Nitrate (Nitrite)	2.7E+04 (3)	No Data	3.4E+03	NA	Unknown	Y
Palladium	No health based concentrations				Unknown	N

**CONTAMINANTS OF CONCERN
RESIDENTIAL SCENARIO
CPR-79**

CONTAMINANT	INGESTION	INH/DUST	GROUNDWATER ¹⁰	EXTERNAL EXPOSURE	CURRENT ESTIMATED CONCENTRATION	CONTAMINANT OF CONCERN (Y or N)
Phosphorus	No health based concentrations				Unknown	N
Potassium	Reject - Track 2 Guidance				Unknown	N
Rhodium	No health based concentrations				Unknown	N
Ruthenium	No health based concentrations				Unknown	N
Sodium	Reject - Track 2 Guidance				Unknown	N
Sulfate	No health based concentrations		8.4E+04 (3)	NA	Unknown	N
Zirconium	No health based concentrations				Unknown	N
Hexone	1.4E+04	2.1E+07 (6)	8.1E+03	NA	Unknown	N (5)
Tetrachloroethylene	1.3E+01	5.4E+02	1.7E+00	NA	Unknown	Y
Tributyl Phosphate	3.3E+05 (6)	2.7E+09 (6)	2.0E+05 (6)	NA	Unknown	N (5)
1,1,1-Trichloroethane	2.5E+04	3.2E+08 (6)	6.7E+01	NA	Unknown	Y
1,1,2-Trichloroethane	1.1E+01	1.5E+05 (6)	6.7E+02	NA	Unknown	Y
Trichloroethylene	5.8E+01	5.1E+05 (6)	5.0E+00	NA	Unknown	Y

NOTES:

- (a) Using a 16m effective thickness to groundwater (interlined thickness only) as input to GW Screen.
- (b) For ingestion of lead, this was the concentration that causes increased blood lead levels in children.
- NA: Not Applicable
- Shade: Shaded areas represent the potential pathways of concern for the COC.
- RATIONALE FOR DELETION AS COC
 - (1) More than 7 half-lives will lapse during the 100 year institutional control period.
 - (2) More than 7 half-lives have lapsed since the original incident in 1976.
 - (3) Based on the highest value in HLLW for this contaminant, saturated soil would exhibit an activity/concentration of the same order of magnitude, or lower, as compared to the risk based concentration. Therefore, it is not a COC for this pathway. Saturated soil concentrations were calculated based on a soil porosity of 25% and a dry soil weight of 1.5 mg/cc.
 - (4) Risk based concentrations are greater than or equal to the calculated specific activity of the pure radionuclide.
 - (5) Although analytical data is currently unavailable, the risk based concentrations for these contaminants are significantly higher than process knowledge of the HLLW would allow. These solvents must survive a steam stripper to get to the HLLW tanks.
 - (6) These numbers are of the same order of magnitude, or higher, as would be obtained from soil saturated with pure product.

MEMORANDUM

To: Files on Contaminants of Concern (COC) for OU3-7 and OU3-8
Subject: COC for Incidents Involving High Level Liquid Waste (HLLW) from the Tank Farm

A list of potential contaminants of concern for the CPP-26, CPP-32e, CPP-79 sites was generated based on the constituents of High Level Liquid Waste (HLLW). Each of the sites involved contamination from the HLLW system. (The rationale is applicable to any sites where soil is contaminated with HLLW.) The constituents were obtained from a R. I. Donovan letter of 8/14/89, "1989 Tank Farm Inventory" (RID-08-89). The potential contaminants Tributyl Phosphate and Hexone were also added to the list of potential contaminants based on process knowledge of their involvement in fuel reprocessing. Tetrachloroethylene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, and trichloroethylene were also added to the list due to suspicions that significant quantities went through the PEW and may have gotten to the PEW bottoms that go to the tank farm.

Risk based concentrations for different pathways (Ingestion, Inh/Dust, Groundwater, External Exposure) were produced for each of the COC under a residential scenario. If actual analytical results were available for these different sites, a comparison to the risk based concentrations could take place to determine if risk levels were exceeded. If the risk levels are not exceeded then there is no concern. However, with limited exceptions, there are no analytical data available on the sites under investigation and therefore assumptions were made to estimate the maximum contaminant concentrations that could be expected. The rational used was to assume the following:

- The incident involves soil saturated with the HLLW (even if dilution was likely to have been involved);
- Porosity of the soil is 25% (i.e., of a 1cc volume, .25cc, or .25ml, could be taken up by the HLLW);
- The weight of the soil to be 1.5 grams/cubic centimeter; and
- The waste solution weight is assumed to be the same as water.

With these assumptions a cc of soil would weight 1.75 g (1.5 g for the soil and .25 g for the liquid contaminant) and it would contain .25 ml of the liquid. From this, a concentration conversion factor of .25 milliliters / 1.75 grams mass can be generated, which is .143 ml / g.

With these assumptions the following steps were taken to calculate the concentration levels of the contaminates of concern. Trying to get the worst case scenario, the document that R. I. Donovan supplied was used to pick out the highest concentration level for each of the contaminants of concern in the HLLW. There are two categories of contaminants, chemical and radiochemical. The chemical contaminants were found using the high value and the 0.143 ml/g conversion factor. For example:

For cadmium, the high concentration from the R. I. Donovan letter was 11.69 g/L or 1.2E-02 g/ml. If in the soil this becomes

$$(1.2E-02 \text{ g/ml})(0.143 \text{ ml/g}) = 1.7E-03 \text{ g/g} = 1.7E+03 \text{ mg/kg}$$

This last number is the maximum cadmium concentration due to the HLLW in a saturated soil sample.

The Radiochemical contaminants were also found using the high value, and the conversion factor and, depending on whether the concentration was reported as gm or Ci per volume, the Specific Activity formula. Uranium and Plutonium were found by using a second table provided by R. I. Donovan which broke these contaminants into isotopes (the letter reported U and Pu as total values of all isotopes). As an example of the calculation for a radionuclide,

For Technecium-99, the high concentration in HLLW is .98 mg/L or 9.8E-04 g/l. The Specific Activity for Te-99 is

$$\begin{aligned} \text{Spec. Act} &= 3.578E+05/(2.13E+05)(99) = 1.7E-02 \text{ Ci/g} \\ &= 1.7E+10 \text{ pCi/g} \end{aligned}$$

(Where 2.13E+05 is the half-life and 99 the atomic weight.)

Conc. in Ci is

$$\begin{aligned} (9.8E-04 \text{ g/L})(1.7E+10 \text{ pCi/g}) &= 16.7E+06 \text{ pCi/L} \\ &= 1.67E+04 \text{ pCi/ml} \end{aligned}$$

and the concentration in saturated soil is

$$(1.67E+04 \text{ pCi/ml})(0.143 \text{ ml/g}) = 2.4E+03 \text{ pCi/g}$$

Feeling the concentrations calculated in this manner are conservative (worse case) they were compared to the risk based concentrations. If the risk levels were of the same order of magnitude or higher, it was felt the site contaminant could never exceed them, and the contaminant was removed from the list of contaminants a concern. The calculated saturated soil concentrations are provided in the table on the following page.

Calculated Saturated Soil Concentration

Radionuclides	Conc. (pCi/g)	Non-Rad Components	Conc. (mg/kg)
Strontium-90	9.2E+07	Boron	2.6E+02
Technecium-99	2.4E+03	Cadmium	1.7E+03
Iodine-129	1.1E+04	Chromium	9.6+01
Cesium-137	9.3E+07	Fluoride	5.5E+03
Europium-154	1.3E+06	Lead	3.9E+01
Uranium-234	1.4E+02	Manganese	1.5E+02
Uranium-235	4.0E+00	Mercury	1.2E+02
Uranium-238	7.1E+00	Molybdenum	1.0E+01
Neptunium-237	2.3E+02	Nickel	4.6E+01
Plutonium-238	8.3E+04	Nitrate	5.1E+04
Plutonium-239	1.1E+04	Sulfate	9.8E+02
Plutonium-240	4.0E+03		
Plutonium-242	2.3E+00		
Americium-241	1.3E+05		